

DEFENSE AND ARMS CONTROL STUDIES PROGRAM
ANNUAL REPORT, ACADEMIC YEAR 1985-1986

CENTER FOR INTERNATIONAL STUDIES
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Report Documentation Page

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MIT Defense and Arms Control Studies Program
Annual Report, 1985-86

DIRECTOR'S OVERVIEW

The Defense and Arms Control Program reflects MIT's priorities in education, research and public service. Our primary raison d'etre is the education of graduate students. The program serves faculty and students as a locus for research and analysis of relevant technical, strategic, and political aspects of vital national and international security questions. Our public service outreach activities provide analyses for policy makers, educators, journalists, and the general public who want to participate in the political process affecting national security.

First, our students. The program has a healthy and constructively interesting mix of outstanding students with backgrounds in science, engineering, and the social sciences. MIT's great strength in technology offers them a special environment in which to work -- one we believe is unmatched elsewhere, and virtually all seem to find the combination of strengths highly attractive. The quality of the students, their commitment, and their capacity for benefitting from the MIT experience are evident from their career patterns after graduation. A significant fraction of the important contributors to defense and arms control studies, debate, and policy formation have had their training here as graduate students, post-doctoral fellows, or junior faculty. They work at universities, including Columbia, Harvard and the University of Maryland; at research organizations like Brookings, the Institute for Defense Analyses and the Rand Corporation; and in government, including the Departments of Defense and State, the Congress, and the military services and academies.

Research and analysis within the program emphasize current policy questions, particularly those relating directly or indirectly to nuclear weaponry. We do get involved in urgent, timely national security issues. Most recently we have responded to concerns about SDI's technical feasibility and strategic implications, the ramifications of new ABM technology for the ABM Treaty, nuclear winter and its uncertainties, and decisions regarding the small single warhead ICBM (Midgetman). Although we address issues attracting public attention, we also pay great heed to important defense and arms control issues not in the public eye. We are analyzing Soviet military capabilities, doctrine, and decision making, and Soviet military technology. We have also begun to study the role of nuclear weapons (other than SLBMs) in the U.S. Navy.

Program faculty and staff responded to numerous requests this year to speak and to participate in university seminars,

MIT Defense and Arms Control Studies Program
Annual Report, 1985-86

professional and public meetings, and international conferences. Demand for such participation far exceeded available time. Even though a number of worthy endeavors were refused, overcommitment remained more of a problem than we would have wished.

We continue to benefit as we have in the past from the MIT environment, where there is a long history of involvement in national security matters, and many members of the MIT community who cooperate with us or complement our work. The leadership of MIT both support and encourage our efforts.

Finally, we acknowledge our debt to the sponsors of the Defense and Arms Control Program, without whose generous support the program itself would not be possible.

JACK P. RUINA
Professor of Electrical Engineering
Director, Defense and Arms Control
Studies Program

MIT Defense and Arms Control Studies Program
Annual Report, 1985-86

ADMINISTRATION AND FINANCIAL SUPPORT

The Defense and Arms Control Studies Program is part of the MIT Center for International Studies, a research center in the School of Humanities and Social Sciences. Its core funding in fiscal year 1985-86 was provided by MIT, the Carnegie Corporation, the Hewlett Foundation, and the Ford Foundation. Specific projects were funded by the Alfred P. Sloan, Jr. Foundation, the Max and Anna Levinson Foundation, and the Department of Defense.

ASSOCIATED FACULTY AND STAFF

Faculty

William E. Griffith, Professor of Political Science. (On leave 1985-86.)
Stephen M. Meyer, Associate Professor of Political Science.
Steven E. Miller, Lecturer in Political Science.
Barry R. Posen, Associate Professor of Political Science.
(Starting 1987.)
George W. Rathjens, Professor of Political Science.
Jack Ruina, Professor of Electrical Engineering
and Director, Defense and Arms Control Studies Program.
Harvey Sapolsky, Professor of Public Policy and Organization.
Eugene Skolnikoff, Professor of Political Science
and Director, MIT Center for International Studies.

Research Staff

Matthew Bunn, Research Fellow
William Durch, Research Associate
Charles Glaser, Research Associate
Herbert Lin, Post-doctoral Fellow
Lt. Col. Charles Whitechurch, U.S. Air Force Research Associate

Administrative and Support Staff

Amelia Leiss, Assistant Director, Center for International Studies
Frances Stefan Scanlon, Administrative Assistant
Patricia Allaire, Senior Secretary
Natalie Weinberger, Senior Secretary

MIT Defense and Arms Control Studies Program
Annual Report, 1985-86

RESEARCH PROGRAM

Collaborative Research

The Navy and Nuclear War

Charles Glaser and Steven Miller began this study of the history, operations and doctrine of naval nuclear weapons, from both the U.S. and Soviet perspective, in academic year 1985-86. The project recruited expert authors from around the United States to draft chapters of the study, and held a mid-year meeting of authors and other naval experts to evaluate the initial chapter outlines. The study will address such questions as the origins and evolution of the nuclear Navy; U.S. and Soviet naval missions and capabilities; evaluations of conventional naval operations (including offensive and defensive sea control, strategic ASW, and power projection) in the context of a superpower war; the risks of nuclear escalation growing out of such operations; assessments of the role of nuclear weapons in accomplishing certain naval missions; and the implications of limited nuclear weapons use for wartime naval missions.

Soviet Security Studies Working Group

The working group is a research project directed by Professor Meyer and staffed by post-doctoral and graduate research associates. Its principal focus is the study of Soviet military and arms control policies, with particular attention devoted to such topics as: defense decision making, force planning and analysis, threat forecasting and analysis, military technology programs, and military economics. The Working Group meets weekly to discuss ongoing work. It maintains an extensive collection of original Soviet source materials. This year, working group members analyzed Soviet military writers' assessments of United States missile reentry vehicle technology, air defense capabilities, early warning programs, and close air support. They also examined Soviet analyses of the beginning period of war and of major campaigns in World War Two.

Small Intercontinental Ballistic Missile (SICBM) Study

Professor Ruina and Scott Berg continued their investigation of the technical, economic, and strategic implications of the SICBM, popularly known as "Midgetman." Research was completed in academic year 1985-86 and the project report is being written. Midgetman presents new command, control and communications problems for the U.S. Air Force. Providing security for hundreds of nuclear warheads, on mobile launchers dispersed over thousands of square miles, will be a challenge. The system will be the costliest strategic system, per operational warhead, ever devel-

MIT Defense and Arms Control Studies Program
Annual Report, 1985-86

oped by the United States. That anticipated cost led to pressure for multiple warheads ("MIRVs"), which would increase its weight and restrict its mobility. The missile's twin attractions, however, have been precisely its mobility (which would reduce its vulnerability to attack) and its single warhead (which some see as a step toward desirable "deMIRVing" of strategic arsenals). Final decisions on size, payload, and basing mode are yet to be made.

Individual Research Activities

Matthew Bunn worked on a study of the technical issues that accompany negotiated limitations on ballistic missile flight testing; the relative desirability of nuclear counterforce; and the impact of "exotic" technologies on the 1972 U.S.-Soviet Anti-Ballistic Missile (ABM) Treaty.

William Durch continued research on the desirability and feasibility of continued restraints on U.S. and Soviet missile defense programs.

Charles Glaser worked on a book about nuclear weapons theory and policy, and on issues related to the concept of a "transition" from an offense-dominant to a defense-dominant strategic posture.

Herbert Lin completed his analysis of the software requirements of strategic defense; authored a lengthy study of technical problems facing the ABM Treaty; and completed work on the impact of new technologies on strategic nuclear command, control and communications. Dr. Lin began work on a technical assessment of verification issues relating to nuclear sea-launched cruise missiles; and on the theater land-attack capabilities of the U.S. Navy.

Stephen Meyer completed research on possible Soviet responses to the American Strategic Defense Initiative, and also completed a study of Soviet nuclear operations and command and control for inclusion in a book on the management of nuclear operations. He continued research on his own book on defense economics in the USSR.

Steven Miller continued his study of political constraints on the pursuit and achievement of arms control agreements, co-edited a book on strategic defense, and wrote on the relationship of arms control and strategic defense, and on security issues pertaining to NATO's northern flank.

MIT Defense and Arms Control Studies Program
Annual Report, 1985-86

George Rathjens completed a study of the Strategic Defense Initiative and arms control, and continued work on the subjects of "nuclear winter" and the avoidance of nuclear war.

Jack Ruina wrote and spoke widely on strategic defense systems and the technologies of arms control verification.

Harvey Sapolsky completed a study of defense procurement policy, and worked on a history of the Office of Naval Research, and a comparison of U.S. government procurement policies in the defense and health fields.

Charles Whitechurch completed a study of European defense policy and the non-military factors that bind the NATO alliance.

Graduate Student Research Interests

Peter Almquist	Policy Influence of Soviet Military Industry
Jorg Baldauf	Military Decision-Making in the United States and the Federal Republic of Germany
Scott Berg	Technology and Strategic Implications of the Small Intercontinental Ballistic Missile
Marco Carnovale	NATO Nuclear Command and Control
Jeffrey Checkel	Soviet Reentry Vehicle Technology; Soviet Approaches to Arms Control Verification
Owen Cote	U.S. Naval Nuclear Weapons Policy
Ivo Daalder	Western Europe and SDI
William Durch	A Comparative Study of Strategic Defense Under Reagan and Eisenhower
John Fenske	European Security and Domestic Politics in France, 1974-1984
Brian Finn	Soviet Use of Mathematical Modelling Techniques in Military Planning
Sybil Francis	The U.S. Congress and Control of Space Weapons
Catherine Girrier	No First Use of Nuclear Weapons
Thomas Graham	Public Opinion, Government Policy, and Arms Control
Thomas Homer-Dixon	Collective Identity and Political Conflict
Shannon Kile	European Security Issues, NATO Northern Flank Maritime Policy and Operations
John Lepingwell	Soviet Strategic Air Defense
Katherine Magraw	Assessing the Nuclear Test Ban Debate, 1958-63
James W. Moore	Defense of the North Atlantic Sea Lines of Communication
Kimberly Nolan	U.S. Assessments of the Military Balance in Europe

MIT Defense and Arms Control Studies Program
Annual Report, 1985-86

Kevin Oliveau	Computer Modelling of Security Issues
Matthew Partan	Soviet Strategic Defense Sensor Programs
Laura Reed	Nuclear Weapons-Free Zone Issues
Eugene Rumer	Impact Soviet Military History on the Development of Soviet Military Art and Science.
Daniel Shepard	Patterns of Soviet Response to Western Military Innovation
Ronald Siegel	Modelling Conventional Land Warfare
Jeffrey Starr	Command and Control of Tactical Nuclear Weapons
Jonathan Tucker	Antisubmarine Warfare Issues
Lynn Whittaker	NATO Doctrine on Conventional Forces
Robert Zirkle	NATO Command and Control

Degrees Completed, Academic Year 1985-86

James W. Moore	SM June 1986 The Uneasy Triangle: Soviet Influence in Iran and Iraq
Michael Ryan	PhD, February 1986 An Empirical Approach to the Analysis of Special Military Operations: Combat Rescue Operations Model and Implications
Peter Trubowitz	PhD, February 1986 American Politics and Congressional Voting on Arms Control Issues

MIT Defense and Arms Control Studies Program
Annual Report, 1985-86

SEMINARS

Visitors Seminars

September 20, 1985 Prof. John Mearsheimer, Department of Political Science, University of Chicago. "The Social Sciences and Defense Studies."

September 23, 1985 Sen. Georgio LaMalfa, Italian Member of Parliament. "European Reactions to SDI."

September 30, 1985 Dr. Peter Zimmerman, Professor of Physics, Louisiana State Univ., on leave with the U.S. Arms Control and Disarmament Agency. "Current Arms Control Policies and the Role of ACDA."

November 1, 1985 Dr. Peter Jennings, CIS Visiting Fellow. "The ANZUS Crisis."

November 18, 1985 Prof. Richard Ned Lebow, Department of Political Science, Cornell University. "The Psychology of Deterrence."

January 7, 1986 Dr. Louis C. Marquet, Director, Directed Energy Office, Strategic Defense Initiative Organization. "Technology and Strategic Defense Research."

February 14, 1986 Col. Robert Haffa, Chief, Long Range Planning Division, Headquarters, US Air Force. "The Air Force and Technology Innovation."

March 7, 1986 Dr. Peter Trubowitz, Research Fellow, Harvard Center for International Affairs. "Domestic Politics, Party Realignment, and the Evolution of U.S. Security"

March 14, 1986 Prof. Condoleeza Rice, Department of Political Science, Stanford University. "Soviet Civil-Military Relations."

March 18, 1986 Michael McC Gwire, Senior Fellow, The Brookings Institution. "Soviet Military Objectives."

MIT Defense and Arms Control Studies Program
Annual Report, 1985-86

April 17, 1986 Prof. Thomas Jordan, MIT Department of Earth, Atmospheric and Planetary Sciences. "Seismic Capabilities for Verification of Nuclear Test Ban Treaties."

April 18, 1986 Dr. Daniel Ellsberg. "The Construction of Instability."

April 25, 1986 Col. Alan Gropman, Deputy Director of Planning Integration, Headquarters, US Air Force. "Air Force Net Assessment and the Battle of the Budget."

May 13, 1986 Gen. C. Georges Fricaud-Changaud (retd.), Director, Institute for the Study of National Defense, Paris, France. "French Defense Policy and Its Contribution to Western Security."

Research Seminars

January 14-16, 1986 Prof. George Rathjens, with John Lepingwell, Kimberly Nolan, and Kevin Oliveau, "Modelling Conventional Forces." (Three-part series.)

January 15, 1986 Thomas Stefanik, "Antisubmarine Warfare."

January 22, 1986 Dr. Stephen Weiner, MIT Lincoln Laboratories "Endoatmospheric Ballistic Missile Defense."

January 22, 1986 Scott Berg, "The Small, Mobile ICBM."

January 23, 1986 Jeffrey Checkel, "Soviet Attitudes on Verification and Proliferation."

January 27, 1986 Jeffrey Checkel, "Gorbachev and the Process of Reform in the USSR."

Weekly Discussion Group

Convened weekly by Charles Glaser and Steven Miller, the group discussed members' research projects, recent articles, and current events. Topics discussed included: the role of arms control in U.S. security policy; anti-satellite weapons and space arms control; Reagan administration anti-terrorism policy; and the debate over academic freedom, academic research, and the Strategic Defense Initiative.

MIT Defense and Arms Control Studies Program
Annual Report, 1985-86

CONFERENCES

MIT Symposium on the Strategic Defense Initiative

In November 1985, the Defense and Arms Control Studies Program, in conjunction with the Office of the MIT Provost, sponsored a one-day Symposium on the Strategic Defense Initiative, or "Star Wars." The objective of the Symposium was to present to the MIT Community -- students, faculty, staff, and academic neighbors -- the technical and systems issues involved in considering an effective defense against an ICBM attack. In the morning session, chaired by John Deutch, Provost of MIT, speakers reviewed the history of ABM issues, and discussed SDI systems concepts and critical technologies. Speakers for the morning session included Alexander Flax of the Institute for Defense Analyses; Ashton Carter of Harvard University; Richard Garwin of IBM; Hans Mark of the University of Texas; and Gerold Yonas of the Strategic Defense Initiative Office, Department of Defense.

The afternoon session, chaired by Louis Smullin of MIT's Department of Electrical Engineering and Computer Science, dealt with strategy and policy issues, and speakers offered their personal perspectives on SDI. Speakers included Fred Hoffman of R & D Associates/Panheuristics; Jack Ruina of MIT; Brent Scowcroft, former White House National Security Advisor; and Jerome Wiesner, President-Emeritus of MIT and former Science Advisor to President Kennedy.

More than 500 members of the MIT/Cambridge community attended the Symposium. Summary proceedings of the day-long event are available.

Conference on Technical/Legal Issues and the ABM Treaty

In March 1986, twenty experts on the 1972 U.S.-Soviet ABM Treaty convened at MIT to discuss the impact of changing political attitudes and evolving technology on this agreement, which is considered by supporters and detractors alike to be the cornerstone of Soviet-American arms control. The conference addressed current textual ambiguities in the agreement, the impact of SDI, and concerns about Soviet treaty compliance. Participants included members of the U.S. SALT I delegation who negotiated the ABM Treaty, as well as officials of the U.S. government who have the responsibility of interpreting the Treaty today.

MIT Defense and Arms Control Studies Program
Annual Report, 1985-86

In addition to DACS faculty and fellows, participants included Albert Carnesale, Academic Dean of the Kennedy School of Government, Harvard University; Ashton Carter, Assistant Professor of Public Policy, Kennedy School; Abram Chayes, Professor, Harvard Law School and former Legal Advisor to the Department of State; Antonia Handler Chayes, Chair, Endispute, Inc. and former Under-Secretary of the Air Force; John Harvey, Lawrence Livermore National Laboratory; Spurgeon M. Keeny, Jr., Director, Arms Control Association, former Deputy Director, U.S. Arms Control and Disarmament Agency; Michael Krepon, Senior Fellow, Carnegie Endowment; Lee Minichiello, Office of the General Counsel, Department of Defense; John Pike, Federation of American Scientists; John B. Rhinelander, Attorney, former Counsel to the U.S. SALT I delegation; Alan Sherr, Research Fellow, Center for Science and International Affairs, Kennedy School, and president, Lawyers Alliance for Nuclear Arms Control; Sherri Wasserman, Harvard Law School; Stephen Weiner, MIT Lincoln Laboratories; Charles Whitechurch, Lt. Col., USAF Research Associate, MIT Center for International Studies.

MIT/HARVARD Summer Program on Nuclear Weapons and Arms Control

For the fourth consecutive summer, the Defense and Arms Control Studies Program, in cooperation with the Center for Science and International Affairs at Harvard University and with the sponsorship of the Alfred P. Sloan, Jr., Foundation, hosted fifty college faculty from the United States and Western Europe who teach courses on nuclear weapons and arms control issues. An intensive, two-week resident program, it is designed to give participants a firm grounding in the technical aspects of nuclear arms control issues, plus an opportunity to meet and get to know their peers. Participants come from a wide range of backgrounds, from the humanities to the natural sciences. The lecturers were primarily from the faculty and staff of Harvard's Kennedy School of Government and MIT's Defense and Arms Control Studies Program.

Visiting lecturers included Robert Borosage, Director, Institute for Policy Studies, Washington, D.C.; McGeorge Bundy, Professor of History, New York University and former National Security Advisor to President Kennedy; Paul M. Doty, Professor of Biochemistry, Harvard University; David C. Jones, Gen., USAF (retd.), former Chairman, U.S. Joint Chiefs of Staff; William W. Kaufmann, Lecturer, Kennedy School of Government, Harvard; J. Bryan Hehir, Director, Committee on International Peace and Justice, U.S. Catholic Conference; Jennifer Leaning, Director of

MIT Defense and Arms Control Studies Program
Annual Report, 1985-86

Emergency Medicine, Harvard Community Health Plan; Louis C. Marquet, Director, Office of Directed Energy Systems, Strategic Defense Initiative Organization; Michael Nacht, Associate Professor of Public Policy and Acting Dean, Univ. of Maryland School of Public Affairs; Paul Nitze, Special Advisor on Arms Control to the Secretary of State; Bernard O'Keefe, President, EG&G, Inc.; Martin Sherwin, Professor of History, Tufts University.

The "Nuclear Age" Television Project

WGBH -- Boston's public television station -- has embarked upon a thirteen-part television series, to be broadcast in early 1989, about the technology, politics and history of nuclear weapons. Although MIT is neither administratively involved nor has responsibility for the project, planning for such a series started within the Defense and Arms Control Studies Program and MIT's Science, Technology and Society Program, headed by Carl Kaysen. Professors Kaysen and Ruina, Steven Miller, William Dutsch, and Shannon Kile have been working closely with WGBH on program content, and on the written materials to be made available in conjunction with the series for use in college telecourses.

VISITING GROUPS

From November 20-23, 1985, a delegation from the People's Republic of China, sponsored by the United States Information Agency and escorted by Professor William Tow, School of International Relations, University of Southern California, met with members of the Defense and Arms Control Studies Program to discuss arms control issues and, most particularly, the Strategic Defense Initiative. The delegation members also attended the Symposium on that subject co-sponsored by DACS (see description under "Conferences"). The delegation included six persons from the Institute for Contemporary International Relations, and one each from the State Council on International Studies Research Center, the Beijing Institute of International Strategic Studies, the Strategic Research Institute of the Military Academy of the People's Liberation Army, and the Ministry of Foreign Affairs.

On May 14, 1986, a Special Committee on Nuclear Strategy and Arms Control of the North Atlantic Assembly led by Mr. Martin McCusker, Director of the Committee, met with members of the DACS faculty to discuss the strategic and arms control implications of SDI from both the U.S. and Soviet perspective.

MIT Defense and Arms Control Studies Program
Annual Report, 1985-86

RELATED PROFESSIONAL ACTIVITIES

Matthew Bunn gave interviews to the Christian Science Monitor on countermeasures to ballistic missile defense (Dec 1985); to IEEE Spectrum on verification and Soviet compliance with arms control agreements (May 1986); and to Time on technology, strategy and arms control (May 1986). He also attended the DACS conference on technical/legal issues and the ABM Treaty (March 1986).

William Durch spoke to the DACS weekly discussion group on "Antisatellite Weapons and Arms Control" (Oct. 1985); organized the DACS conference on technical/legal issues and the ABM Treaty, at MIT (March 1986); and attended a conference on "Strategic Defense and American-Soviet Relations" sponsored by the Smithsonian's Woodrow Wilson Center for Scholars (March 1986), and a seminar on Anti-Tactical Ballistic Missile Defense Issues held at the American Academy of Arts and Sciences (April 1986). He presented a paper ("The Future of the ABM Treaty: Technical and Political Challenges to Arms Control") at a conference on "New Approaches to Arms Control," sponsored by the London International Institute for Strategic Studies (Barnett Hill, England, May 1986), and lectured on the same subject at the MIT/Harvard Summer Program on Nuclear Weapons and Arms Control (June 1986). Mr. Durch reviewed manuscripts for International Security, the Aspen Strategy Group, and the Georgetown Center for Strategic and International Studies, reviewed research proposals for the Ford Foundation, and served as consultant to WGBH-TV for its "Nuclear Age" project.

Charles Glaser convened, with Steven Miller, a one-day conference at MIT on the Navy and nuclear war (Jan 1986), and participated in a panel at the conference on "Star Wars: Strategy, Technology and Ethics," sponsored by the New York Academy of Sciences and the City University of New York Academy of Humanities and Sciences (Feb 1986). He presented a paper ("The Transition to Highly Effective Strategic Defenses") at a conference on "Strategic Defense and Soviet-American Relations" held at the Woodrow Wilson Center (March 1986), and lectured on that subject at the Center for Science in International Affairs and the Center for International Affairs, Harvard University (April 1986).

Herbert Lin attended conferences on military command, control, communications, and intelligence sponsored by the American Academy of Arts and Sciences, Washington, D.C. (Summer 1985), and on technical/legal issues and the ABM Treaty (March 1986), sponsored by DACS. He also made presentations on software issues for ballistic missile defense at AT&T Bell Labs, Columbus,

MIT Defense and Arms Control Studies Program
Annual Report, 1985-86

Ohio; the University of Michigan-Ann Arbor; Princeton University; Carnegie Mellon University; and the Annual Meeting of the American Physical Society. He was interviewed on SDI by National Public Radio, the Australian Broadcasting Corporation, WGBH television, and British television, and served as a consultant to the Public Television series, "Front Line" and "Nova," for their program on SDI.

Stephen Meyer gave presentations on "Technology Transfer and the Soviet Union" at a conference sponsored by the Analytical Services Corporation, Boston; on "Learning from Experience with Arms Control" at the Kennedy School of Government, Harvard University; and on "Soviet Nuclear Doctrine, Decision-making, Forces and Operations" at the MIT/Harvard Summer Program on Nuclear Weapons and Arms Control. He also participated in a seminar, sponsored by Time Magazine, on the Strategic Defense Initiative. Prof. Meyer served on the editorial board of International Security; as a manuscript reviewer for Chicago University Press, MIT Press, Cornell University Press, and Cambridge University Press; and as a consultant to U.S. government agencies.

Steven Miller attended a meeting on "The Defense of Europe," sponsored by the Lehrman Institute, New York; participated in workshops on "Arms Control and Strategic Defense" sponsored by Oak Ridge National Laboratory, Washington D.C.; and presented papers on "U.S. Naval Policy and the Northern Flank" at the "Colloquium on the Soviet Union and Northern Waters," sponsored by the University of Aberdeen, Scotland, and on "The Evolution of Post-war U.S. Naval Policy" at a meeting sponsored by the Lehrman Institute, New York. He also attended conferences on "Redefining Arms Control," sponsored by the Stanley Foundation, and on "Learning from Experience with Arms Control," sponsored by the Kennedy School of Government, Harvard University. He served as co-editor of the journal International Security, as a manuscript reviewer for MIT Press, and as consultant to WGBH-TV for its "Nuclear Age" project.

George Rathjens lectured both in the United States and abroad on nuclear weapons and arms control-related issues. As Kistiakowsky Visiting Scholar of the American Academy of Arts and Sciences, he lectured at Drake University, Ripon College, Connecticut College and the United States Coast Guard Academy. He also lectured at the Virginia Military Institute, the Committee for National Security, and at the John F. Kennedy School of Government at Harvard University. Dr. Rathjens spoke at the University of Miami's Center for Theoretical Studies workshop for faculty from southern colleges and universities, where he served as a Visiting

MIT Defense and Arms Control Studies Program
Annual Report, 1985-86

Scholar. In addition to these talks, he participated in a number of radio broadcasts, including "Peace in a Nuclear Age" and a BBC interview on weapons procurement and strategic missiles.

Dr. Rathjens served as Chairman of the Council for a Livable World and as a member of the Executive Committee of the Exploratory Project on the Conditions for Peace. As a member of Aspen Strategy Group, he attended meetings in Aspen, Colorado -- where he served as a discussant on "SDI and the US Defense Posture" -- and in Berlin, Federal Republic of Germany. He also participated in a meeting with noted members of the Soviet scientific community, held in San Francisco and sponsored by the Institute for Policy Studies.

During 1985-86 Prof. Rathjens participated in a Review Meeting of the Scientific Committee on the Problems of the Environment of the International Council of Scientific Unions, at Essex University, United Kingdom; attended a conference on "Strategic Stability and Mutual Security in the Year 2000," sponsored by the United Nations and held in Erice, Italy; and participated in a conference on the "Calculus of Terror: Nuclear Strategy and Its Discontents," sponsored by the University of California at Los Angeles and held in Bellagio, Italy. Dr. Rathjens participated in the meeting of the Italian Society of Physicists held in Castiglioncello, Italy, in the Fall of 1985. He also attended Pugwash meetings in Sao Paolo, Brazil and London, England.

Professor Rathjens serves on the "Crisis Stability and Nuclear War" project being conducted by the American Academy of Arts and Sciences; as a reviewer for the MacArthur Foundation Grants for Research and Writing in International Security; and as a consultant on the WGBH-TV "Nuclear Age" project.

Jack Ruina participated in a number of conferences both in the United States and abroad. Within the United States he was involved in meetings at the American Academy of Arts and Sciences, Lawrence Livermore Laboratory, the University of California at Los Angeles, and the German Workshop held at the Center for European Studies, Harvard University. He was also involved in the American Academy Center for Nuclear Age Studies and participated in an American Academy meeting on Arms Control Efforts, and a National Academy of Sciences Seminar on Crisis Management in the Nuclear Age. Dr. Ruina is a member of the National Academy of Sciences Committee on Contributions of Behavioral and Social Science to the Prevention of Nuclear War, which held several meetings during the

MIT Defense and Arms Control Studies Program
Annual Report, 1985-86

year, and is on the Advisory Board of the WGBH-TV "Nuclear Age" project.

Overseas, Dr. Ruina spoke at a Council for a Livable World symposium on SDI in London, England, and participated in a meeting of the Italian Society of Physicists at Castiglioncello, Italy, both in the Fall of 1985. In the Spring of 1986, he was invited to participate in a meeting of the North Atlantic Assembly in Luxembourg. He also serves on the Pugwash Council.

Professor Ruina's public presentations related primarily to strategic defense and SDI -- at the Wellesley Summer Workshop for College Teachers, at the MIT Clubs of Boston and Philadelphia, and at Stanford University. He served as a visiting professor for the Nuclear War-Nuclear Peace course taught at the Center for Theoretical Studies, University of Miami, Coral Gables, Florida. In this capacity he gave two class lectures and one public lecture. He also gave presentations on "Technological Issues in Treaty Verification and Compliance," and on "Command and Control: Technical Aspects" at the Crisis Stability and Command and Control session of the National Academy of Sciences Seminar on Crisis Management. He spoke on "The SDI Debate Today" at the "Seminar for National Journalists on the Strategic Defense Initiative," sponsored by the Institute of Politics, Harvard University; and on "Antisatellite Weapons" at a meeting sponsored by the New York Academy of Sciences. Dr. Ruina also organized a session of the Defense Science Study Group Meeting held at the Institute for Defense Analyses and spoke on the topic of "Surveillance and Verification of Arms Control." This activity is carried out for the Department of Defense and is intended for young science faculty members. He spoke at a Time Magazine workshop for senior editors on the Strategic Defense Initiative, which served later as the basis for a Time cover story.

Harvey Sapolsky gave a presentation on the Polaris Program to the WGBH-TV "Nuclear Age" project, and presented a paper, "The Office of No Return?: The Office of Naval Research and the Issue of Relevance" to the "Workshop on the Military and Post-War Academic Science" sponsored by the Johns Hopkins University.

Charles Whitechurch participated in a two day crisis management simulation at the Fletcher School of Law and Diplomacy; attended the MIT symposium on the Strategic Defense Initiative, the conference on legal/technical issues and the ABM Treaty, a Fletcher School conference on the inter-relationship of technology and defense, and the MIT/Harvard summer program on nuclear weapons and arms control; and participated in Harvard's Ford Seminar on

MIT Defense and Arms Control Studies Program
Annual Report, 1985-86

European Society and Western Security, and seminars of the Institute for Foreign Policy Analysis. He gave lectures at the MIT Science, Technology and Society Program, and to a graduate course on Defense Politics.

TEACHING PROGRAM

MIT faculty associated with the Defense and Arms Control Studies Program offered the following courses in academic year 1985-86:

American Security in the Nuclear Age (Miller) surveyed American security policy since World War II, including post-War demobilization, U.S. assumption of new global responsibilities, the Korean War and rearmament, the "nuclearization" of American defenses in the 1950s, the "McNamara revolution" in defense management, the Vietnam War and the problem of intervention, and the Nixon Doctrine (supporting allies with U.S. arms rather than U.S. troops).

Defense Politics (Sapolsky) surveyed the structure of U.S. defense policy making, reviewing decision-making in the civilian defense bureaucracy and the National Security Council system, as well as in the military services. The course is intended to give students a feel for the workings of the contemporary defense establishment, with particular emphasis on weapon procurement policies and politics.

Military Forces and Foreign Policy (Meyer, Miller) assessed U.S. and Soviet defense policies, foreign policies and the use of their military forces since 1945. The course examined 20 historical cases involving deterrence of central war, coercive diplomacy, crisis management, and limited military intervention. Participants discussed the implications of case outcomes for military force posture planning and military strategy.

Nuclear War: Threat and Avoidance (Rathjens, Ruina, et al.) is a School-wide elective course designed to introduce undergraduate students to the history and technology of nuclear weapons, arms control, and related contemporary issues.

Quantitative Approaches to Defense Problems (Rathjens) introduces students to the methods of systems analysis for decision-making in defense and arms control policy and weapons procurement. Techniques reviewed included Monte Carlo modelling, linear programming, nuclear exchange models, and indifference curves.

MIT Defense and Arms Control Studies Program
Annual Report, 1985-86

Research Seminar in Soviet Security Studies (Meyer) is an advanced-topics seminar in Soviet security, which examined historical and contemporary issues in Soviet defense planning.

Seminar in Arms Control (Rathjens, Ruina) is the follow-on to Technology of Nuclear Weapons and Arms Control. It covered in detail specific cases and topics in contemporary strategic arms control endeavors. Topics vary year by year. In the spring 1986 seminar, participants discussed the Strategic Defense Initiative, the question of no first use of nuclear weapons, and nuclear non-proliferation issues and policy.

Soviet Defense Planning (Meyer) examines the political, economic, and military determinants of Soviet military policy in this introductory course. Soviet military doctrine, strategy, organization and weapons procurement were studied from the perspective of Soviet defense planners.

Statecraft, Strategy, and War (Miller) reviewed the main ideas and concepts of the most influential strategists of land, sea and air warfare, from Machiavelli to Mahan; considerations affecting the choice of military strategy by states and statesmen; and factors determining the likelihood, the course and the outcome of war. The course acquaints students with the major works in the literature on strategy, warfare, and the modern state.

Technology of Nuclear Weapons and Arms Control (Rathjens, Ruina) is a basic introductory course for graduate students that reviews technical issues bearing on nuclear weapons policy, the arms race, and arms control. Contents include the description of fission and fusion weapons and their effects; basics of nuclear proliferation as a technology and policy issue, and of nuclear delivery systems, ballistic missile defense and air defense technologies, monitoring technologies for verification of arms control agreements, and measures of the strategic balance.

Courses not listed above that are to be offered in academic year 1986-87 include:

Griffith Seminar on European Security

Meyer Theory and Practice of Soviet Decision Making

Miller Theory and Politics of Arms Control

MIT Defense and Arms Control Studies Program
Annual Report, 1985-86

PUBLICATIONS

Berg, Scott, "Midgetman: The Technical Problems," Arms Control Today, Nov/Dec 1985.

Durch, William, "The Future of the ABM Treaty: Technological and Political Challenges to Arms Control," paper presented to the IISS Conference on New Approaches to Arms Control, Barnett Hill, England, May 7-9, 1986.

Glaser, Charles, "Why Strategists Disagree About the Requirements of Deterrence," to be included in a volume of essays produced by the Harvard University Center for Science and International Affairs Working Group on Explicating the Nuclear Debate.

____ "The Transition to Highly Effective Strategic Defenses," paper presented at the Wilson Center Conference on Strategic Defense and Soviet-American Relations, March 10-11, 1986, to be published in Conference Proceedings by University Press of America.

Lin, Herbert, "Software for BMD," Report C85-2, Center for International Studies, Massachusetts Institute of Technology, July 1985.

____ "New Technologies and C³," working paper for the Command and Control/Crisis Stability Group of the American Association for the Advancement of Science.

____ "Development of Software for BMD," Scientific American, December 1985.

____ "New Weapon Technologies and the ABM Treaty," to be published by the Carnegie Endowment for International Peace.

____ "Technology for Cooperative Verification of Nuclear Weapons," Arms Control Today, April 1986.

Meyer, Stephen M., "Soviet Strategic Programs and the U.S. SDI," Survival, November/December 1985.

____ "Soviet Nuclear Operations and Command and Control," in Carter, Steinbruner, and Zraket (eds.), Managing Nuclear Operations, Washington, D.C.: The Brookings Institution, 1986.

MIT Defense and Arms Control Studies Program
Annual Report, 1985-86

Meyer, Stephen M. "Soviet Perspectives on the Paths to Nuclear War," in Allison, Carnesale, and Nye (eds.), Hawks, Doves, and Owls: An Agenda for Avoiding Nuclear War. New York: W.W. Norton & Co., April 1985.

Miller, Steven E., "SALT Shakers," The New Republic, July 8, 1985, pp. 18-20.

_____, "Technology and War," Bulletin of Atomic Scientists, December 1985, pp. 46-48. (A shorter version of this essay appeared as a "Forum Commentary" in Issues in Science and Technology, Summer 1985).

_____, "Kennan the Destroyer," Policy Review, Fall 1985, p. 4. (Letter commenting on Paul Hollander's "The Two Faces of George Kennan.")

_____, "The Viability of Nuclear Arms Control: Domestic and Bilateral Factors," Bulletin of Peace Proposals, V. 16, No. 3, 1985, pp. 263-276.

_____, (ed.) Conventional Forces and American Defense Policy Princeton, N.J.: Princeton University Press, March 1986.

_____, "United States Strategic Interests in Northern Waters," in Clive Archer and David Scrivener (eds.), Northern Waters: Resources and Security Issues, London: Royal Institute of International Affairs, 1986, pp. 116-124.

_____, Review of The Pentagon and the Art of War, Bulletin of the Atomic Scientists, May 1986, pp. 41-43.

_____, (ed., with Stephen Van Evera), The Star Wars Controversy, Princeton, N.J.: Princeton University Press, 1986.

_____, "Arms Control and Strategic Defense: The Uncertain Connection," in Jack Barkenbus and Alvin Weinberg (eds.), Arms Control and the Defensive Transition, forthcoming.

MIT Defense and Arms Control Studies Program
Annual Report, 1985-86

Miller, Steven E. (ed., with Lynn Eden), Explicating the Arms Control Debate (provisionally accepted for publication by Cornell University Press).

Rathjens, George, "A Critical Analysis of the Arms Control Record," in Security vs. Survival: The Nuclear Arms Race, Smith and Singh (eds.), Boulder, Colo: Lynn Rienner Publishers, Inc., 1985.

"Technology and the Arms Race", in Carlton and Schaerf (eds.), Reassessing Arms Control, London: Macmillan Press, Ltd., 1985.

"The Technical (In)feasibility of SDI", to be published.

and Laura Reed, "Neither MAD Nor Starstruck:--and Doubts, Too, About Arms Control," Center for International Studies, Massachusetts Institute of Technology, 1986.

and Jack Ruina, "BMD and Strategic Instability", Daedalus: Weapons in Space, Volume II: Implications for Security, Summer 1985.

and Ronald H. Siegel, "Nuclear Winter: Strategic Significance," in Issues in Science and Technology, Winter 1985.

Ruina, Jack, "Perspectives on Hard-Site Defense", Issues in Science and Technology, Winter 1986.

"SDI: Peer Pressure and Politics on Campus", Technology Review, February/March 1986.

Sapolsky, Harvey, "Review of W. Henry Lambright: Presidential Management of Science and Technology -- The Johnson Presidency," in American Scientist, forthcoming.

"Review of Kenneth P. Werrell: The Evolution of the Cruise Missile," in Armed Forces and Society, in progress.

"Equipping the Armed Forces", in Edwards and Walker, (eds.), The Military and the Constitution, forthcoming.